

What is claimed is:

- 1 1. A circuit comprising:  
2 a voltage-to-current converter having a differential input node and a  
3 differential output node; and  
4 a current multiplier coupled to the differential output node of the voltage-to-  
5 current converter circuit.
- 1 2. The circuit of claim 1 wherein the current multiplier includes an output node,  
2 the circuit further comprising a load device coupled to the output node of the current  
3 multiplier.
- 1 3. The circuit of claim 1 further comprising:  
2 a second voltage-to-current converter having a differential input node and a  
3 differential output node; and  
4 a second current multiplier coupled to the differential output node of the  
5 second voltage-to-current converter;  
6 wherein the current multiplier and the second current multiplier each have  
7 differential output nodes coupled in common.
- 1 4. The circuit of claim 3 further comprising a pair of loads coupled to the  
2 differential output nodes of the current multiplier and the second current multiplier to  
3 develop a differential output voltage.
- 1 5. The circuit of claim 3 wherein the current multiplier comprises:  
2 a diode-connected control transistor; and  
3 a plurality of selectable current source circuits coupled to the diode-connected  
4 control transistor.

1 6. The circuit of claim 5 wherein each of the plurality of selectable current  
2 source circuits includes:  
3 a current source transistor having a gate; and  
4 a select transistor coupled source-to-drain between a gate of the diode-  
5 connected control transistor and the gate of the current source transistor.

1 7. The circuit of claim 1 wherein the current multiplier includes a plurality of  
2 selectable current source circuits to provide a digitally controlled programmable  
3 gain.

1 8. The circuit of claim 7 further comprising:  
2 a second voltage-to-current converter; and  
3 a second current multiplier having a digitally programmable current gain, the  
4 second current multiplier coupled to be responsive to the second voltage-to-current  
5 converter circuit and having an output node coupled in common with an output node  
6 of the current multiplier.

1 9. The circuit of claim 7 wherein the circuit comprises a plurality of voltage-to-  
2 current converters and a plurality of current multipliers, each of the plurality of  
3 voltage-to-current converters being coupled to a corresponding one of the plurality of  
4 current multipliers, and wherein the plurality of current multipliers have output nodes  
5 coupled in common.

1 10. The circuit of claim 9 further comprising a load device coupled to the output  
2 nodes coupled in common.

1 11. A circuit comprising:  
2 a differential pair of input transistors to convert a differential input voltage  
3 into a first differential current;

4 a current multiplier coupled to the differential pair of transistors to produce a  
5 second differential current in response to the first differential current; and  
6 a pair of load devices to produce a differential output voltage in response to  
7 the second differential current.

1 12. The circuit of claim 11 wherein the current multiplier includes a plurality of  
2 selectable current source circuits.

1 13. The circuit of claim 12 wherein each of the plurality of selectable current  
2 source circuits is configured to be responsive to a digital control signal.

1 14. The circuit of claim 11 further comprising:  
2 a second differential pair of transistors to receive a second differential input  
3 voltage; and  
4 a second current multiplier coupled between the second differential pair of  
5 transistors and the pair of load devices.

1 15. The circuit of claim 14 wherein the second current multiplier is configured to  
2 vary a differential output current in response to a second set of digital control signals.

1 16. An integrated circuit comprising a voltage multiplier circuit that includes a  
2 current multiplier with a digitally programmable current gain.

1 17. The integrated circuit of claim 16 further comprising a voltage-to-current  
2 converter circuit coupled to an input side of the current multiplier.

1 18. The integrated circuit of claim 17 further including a processor coupled to the  
2 current multiplier to provide a digital value such that an output current of the current

3 multiplier is responsive to the digital value and a voltage input to the voltage-to-  
4 current converter circuit.

1 19. The integrated circuit of claim 16 wherein the current multiplier comprises a  
2 plurality of current mirrors with digitally programmable gain, each of the plurality of  
3 current mirrors having a common output node.

1 20. The integrated circuit of claim 19 further comprising a plurality of voltage-to-  
2 current converter circuits, wherein each of the plurality of voltage-to-current  
3 converter circuits is coupled to a corresponding one of the plurality of current  
4 mirrors.

1 21. The integrated circuit of claim 20 further comprising a load device coupled to  
2 the common output node to produce an output voltage from a sum of current mirror  
3 output currents.

1 22. The integrated circuit of claim 16 wherein the integrated circuit is a circuit  
2 type from the group comprising: a processor, a processor peripheral, a memory, and a  
3 memory controller.

1 23. An integrated circuit comprising:  
2 a plurality of voltage-to-current converters to receive a plurality of  
3 differential input voltages and produce a plurality of differential currents; and  
4 a plurality of current multipliers coupled to a common output node, each of  
5 the plurality of current multipliers coupled to a corresponding one of the plurality of  
6 voltage-to-current converters to receive a corresponding one of the plurality of  
7 differential currents.

1 24. The integrated circuit of claim 23 further comprising a load device coupled to  
2 the common output node to produce an output voltage.

1 25. The integrated circuit of claim 23 wherein each of the plurality of current  
2 multipliers has a programmable current gain.

1 26. The integrated circuit of claim 25 wherein each of the plurality of current  
2 multipliers includes a digital input port to influence the programmable current gain.

1 27. The integrated circuit of claim 25 further comprising a processor coupled to  
2 the plurality of current multipliers to set the programmable current gain.

1 28. The integrated circuit of claim 23 wherein the integrated circuit is a circuit  
2 type from the group comprising: a processor, a processor peripheral, a memory, and a  
3 memory controller.